



Photo: John Cooper

Paths to Achievement

Section 9: Paths to Achievement

9.1 Introduction

Many different projects and programs have been implemented in the Lake Erie basin over the years, some of them binational in scope. Most previous programs have focused on one particular issue or medium, such as water quality, fish populations, contaminated sediments, physical processes, reducing phosphorus, controlling discharge from industries and wastewater treatment plants, monitoring, etc. The LaMP addresses these same issues but from an ecosystem perspective. The ecosystem approach allows a more holistic, comprehensive assessment of problems and the management actions needed to address them. To the extent possible, implications of management actions will be reviewed for the entire ecosystem and not just the ecosystem component the action is meant to address. Many times research, assessment and management needs are not coordinated with each other. With the involvement of all the jurisdictional agencies around the lake, researchers, the private sector and the public, it is the LaMP's intention that programs are not designed in a vacuum, that the most important issues will be identified, and that limited resources will be applied to the highest priorities.

The goal of the LaMP is to describe the current state of the lake and set objectives to achieve what we, as the Lake Erie community, envision for a sustainable Lake Erie ecosystem in the future. As described in Section 3, ecosystem objectives will be selected by considering ecological issues (fisheries, wildlife, habitat, etc.), socio-economic issues (human uses/benefits from the lake), and health issues (both ecological and human). Once the ecosystem objectives are set, the LaMP will provide a road map to lead us toward those objectives. Many of the management and remedial actions that will be recommended in the LaMP will need to be adopted and implemented under other programs and by the agencies that have jurisdiction over those particular areas/issues in question. The LaMP has already leaned heavily on some existing programs for objectives and beneficial use impairment assessments. A number of federal, state, provincial and local government programs and policies are already in place serving to improve Lake Erie environmental quality. Many of these complementary programs are referenced throughout the Lake Erie LaMP 2000 document. Listed in Section 9.2 are the binational programs that support LaMP goals and represent some binational paths to achievement.

Habitat loss has already been defined as a major stressor and a beneficial use impairment by the Lake Erie LaMP. Several habitat projects have been completed over the years, and a number of others are underway or proposed. Section 9.3 presents a preliminary list of ongoing and proposed projects, as well as several that have recently been completed. More importantly, it proposes a foundation for developing a Lake Erie habitat restoration and protection plan, and also outlines screening criteria to assist in selecting and highlighting habitat projects that will most strongly support the goals of the Lake Erie LaMP.

The Lake Erie LaMP has identified mercury and PCBs as critical pollutants. Preliminary action plans listing ongoing and proposed actions to further assess and reduce these contaminants in the lake are presented in Sections 9.4 and 9.5. By establishing such a baseline of activities, we will be able to track implementation of efforts to reduce these chemicals. All of the LaMP partner agencies and organizations are encouraged to provide additional actions.

9.2 Connections to Existing Programs

Remedial Action Plans

In addition to the development of LaMPs, the GLWQA called for the development of remedial action plans (RAPs) for the Great Lakes areas of concern. There are 12 areas of concern in the Lake Erie watershed (Appendix A). The RAPs and the LaMP process are very similar in that they use an ecosystem approach to assessing and remediating environmental degradation, focus on the 14 beneficial use impairments listed in Annex 2, and utilize a structured public involvement process. The RAPs for the St. Clair River and the Detroit River are also binational in scope. However, although the RAP and LaMP programs are alike in theory, they are very different in practice.

The RAPs have a much smaller geographic focus, looking at single watersheds or parts of watersheds. Although there is a component that considers the impact of that particular area of concern on Lake Erie, the main focus is on environmental degradation in that specific area and remediating the beneficial use impairments locally. Public participation in the RAPs is quite robust and very *hands-on* as the stakeholders are working on projects in their own backyards, and many times have the lead on those projects. Implementation has been underway in most RAPs for a number of years using a combination of federal, state, provincial and local resources. In most cases, the causes of impairment are related to sources within the area of concern.

Any improvement in an area of concern will eventually help to improve Lake Erie, but the effect will be much more visible and measurable locally. In some cases, remediation of a contaminated site within an area of concern may have impacts on the entire lake, particularly if the cleanup involves removal of a source of persistent toxic substances. It is important to continue to cultivate a stronger connection between the RAPs and the LaMP, particularly in establishing priority actions that will be most effective in restoring the Lake Erie basin. Updates and the current status of Lake Erie's RAPs are included in Appendix A.

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Great Lakes Fishery Commission

The Great Lakes Fishery Commission oversees a binational, Great Lakes basinwide, fisheries management program. The role of the Great Lakes Fishery Commission is to conduct coordinated fisheries research on the lakes and recommend measures which will permit the maximum sustained productivity of stocks of fish of common concern between the U.S. and Canada. They also have the responsibility to formulate and implement a program to eradicate or minimize sea lamprey populations in the Great Lakes. The Great Lakes Fishery Commission takes into account water quality, habitat and other environmental factors, with the main goal of preserving and enhancing the fish community by supporting establishment of a healthy Lake Erie ecosystem. The Lake Erie Committee (LEC) of the Great Lakes Fishery Commission develops and implements the management strategy specific to Lake Erie. Members of the LEC have been very active in developing ecosystem objectives for the Lake Erie LaMP, and some of the LEC's goals and objectives for Lake Erie were used as the basis against which to determine the status of several of the beneficial use impairments. The LEC is also the *major action arm* of the Great Lakes Fishery Commission that oversees the implementation and development of operational plans under the binational inter-jurisdictional *Joint Strategic Plan for Management of Great Lakes Fisheries*. The Joint Strategic Plan was adopted in 1981 in response to the need to better coordinate fisheries and ecosystem management initiatives. The Joint Strategic Plan was revised in 1997 to strengthen fisheries and ecosystem management coordination based on lessons learned since the 1981 signing and in regard to implementation of the Great Lakes Water Quality Agreement. Building stronger ties with LaMPs and RAPs is particularly specified in the goals of the Plan.

North American Waterfowl Management Plan

The North American Waterfowl Management Plan (NAWMP) is a strategic framework to protect, enhance and create 6 million acres of wetland habitat critical to waterfowl and other wetland wildlife in Canada and the U.S. The goal is to restore waterfowl populations to the averages observed during the 1970-1979 period. The NAWMP was developed in

cooperation with all the applicable state and federal wildlife management agencies. Objectives are translated into action through “joint venture areas.” Joint ventures are regional public/private partnerships where the partners agree to develop goals and objectives for a particular species or habitat in a particular geographic region. An example is the Lake Erie Marshes Focus Area Plan, which applies to the Lake Erie basin in Ohio. The plan calls for enhancement and restoration of 7,000 acres of existing protected wetland habitat and acquisition or protection of 11,000 additional acres.

Great Lakes Binational Toxics Strategy (BTS)

Although there has been significant reduction in the amount of contaminants released directly into the Great Lakes, there is a continuing presence of persistent toxic substances resulting from atmospheric deposition, contaminated sediment, releases from certain industrial processes, nonpoint source runoff and the continuous cycling of substances within the lakes themselves. Interbasin transfer of persistent toxic substances from one lake to another, and the short-range and long-range movement and deposition of these substances from air prompted U.S. EPA and Environment Canada to sign the Great Lakes Binational Toxics Strategy (BTS) in 1997. The goal of the binational strategy is to work towards the virtual elimination of persistent toxic substances resulting from human activity, particularly those that bioaccumulate. Specific reduction targets for the Great Lakes basin have been set for many of the contaminants of concern in the Lake Erie LaMP, with a primary emphasis on achieving reductions using pollution prevention.

The BTS states that more strategic and coordinated interventions are required at various geographic scales from the local watershed/area of concern to the lakewide, basinwide, national and international arenas. The Lake Erie LaMP will be looking to the BTS to provide some support for the reduction of out-of-basin sources, particularly those related to atmospheric long-range transport. The BTS reaffirms the two countries’ commitment to the sound management of chemicals, as stated in *Agenda 21: A Global Action Plan for the 21st Century* and adopted at the 1992 United Nations Conference on Environment and Development. The BTS will also be guided by the principles articulated by the International Joint Commission’s Virtual Elimination Task Force.

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Lake Erie at the Millennium Plan

The Lake Erie at the Millennium Plan (LEMP) was initiated in 1998 by scientists at the University of Windsor and the National Water Research Institute - Burlington in Ontario, the F.T. Stone Laboratory of The Ohio State University, and the U.S. EPA Large Lakes Lab at Grosse Ile, Michigan. The objective was to foster and coordinate research that will identify and solve basic ecological questions relevant to the Lake Erie ecosystem through a binational, collaborative network.

To be relevant to regional and binational groups responsible for Lake Erie’s health, the research must address management needs as well as further basic knowledge of the ecosystem. To this end, the active sponsorship of agencies and organizations whose mandate concerns Lake Erie was solicited. Twelve binational, national, regional, state, and provincial organizations have contributed funds to sponsor LEMP activities. Additionally, 13 collaborating organizations are active participants in the planning, information transfer or research aspects of the LEMP, providing in kind and/or technical support that further Plan activities. Goals of the LEMP are:

1. To collectively document the research and management needs of users and agencies;
2. To summarize the current status of Lake Erie from process and ecosystem function perspectives; and
3. To develop a framework for a binational research network to ensure coordinated collection and dissemination of data that addresses the research and management needs.

In November 1998 a *Prevailing Issues Workshop* held at the University of Windsor brought together Lake Erie managers, researchers, and other interested parties to discuss the major questions and management issues for Lake Erie. The workshop participants reviewed and distilled over 90 issues that had been identified as management concerns in response to a

broader request for issues. The panel identified 48 separate topics, which were then organized into seven subject areas. Participants then evaluated the ecological, economic, human health and societal importance of each issue, the perceived understanding of the issue, and the priority that each issue was receiving from agencies. The seven subject areas were: physical features; loadings and flux; environmental features; open-water biotic processes; nearshore and coastal biotic processes; invaders; and human-related concerns. These subject areas became focal directions for a modeling summit held in June 1999 and the binational *Lake Erie at the Millennium Conference* held in April 1999.

The purpose of the LEMP Conference was to compile current knowledge of Lake Erie processes, forecast trends for the next three to five years, and identify critical research gaps. Over 170 individuals attended the four-day event. The 48 invited speakers were additionally asked to cast their special expertise in the context of the previously identified management and data needs. The conference culminated in a *research needs* workshop that summarized consensus on the seven themes. The conference program, and major findings and recommendations of the workshop are summarized at the LEMP website, which is maintained through collaboration with the IJC's Council of Great Lakes Research Managers (URL: <http://www.ijc.org/boards/cglr/erie2000>).

Invited presenters' peer-reviewed manuscripts will appear as a monograph summarizing Lake Erie's present status, possible future states, and unresolved ecological issues. Seven subject editors' summary chapters will integrate and focus the conclusions and research needs of groups of related chapters. Contributed presentations are being compiled to appear as a special issue of the *Journal of Great Lakes Research*. Both publications should appear in late 2000.

The binational conference and workshops have refined and focussed researchers' and managers' needs into several suites of ecological problems. Each suite will be the focus of a two to three day research definition meeting. The first meeting was held October 1999 and addressed the processes regulating energy flux at the base of the food chain. Subsequent workshops will deal with issues of habitat, fish community dynamics, contaminants, exotic species invasions, and human health. Each workshop will produce a statement of our current understanding of issues, and a proposal to develop suites of key studies that will resolve each of the most pressing research issues. The resulting coordinated four to five year research programs will concurrently generate the data needed to resolve uncertainties in the fundamental management issues.

Linked Canadian and U.S. research proposals will be generated from each workshop for submission to granting agencies. Canadian participants will target the *Natural Sciences and Engineering Research Council* (NSERC) grant program to fund collaborative research proposals. U.S. participants will target U.S. EPA Office of Research and Development's *Science to Achieve Results* (STAR) grant program and other suitable granting agencies. Explicit in the goals of this network is the need for secure, longer-term (four to five year) commitment to the collection, compilation, interpretation and application of data. Lake Erie LaMP member agencies and many of the individuals involved in the LaMP process are also participating in the LEMP program. The LEMP and the LaMP will proceed hand-in-hand to identify and address the most important needs for Lake Erie.

State of the Lakes Ecosystem Conference (SOLEC)

The State of the Lakes Ecosystem Conference (SOLEC) and resulting report are an effort initiated by the U.S. EPA and Environment Canada pursuant to the reporting requirements of the GLWQA. Conferences are held biennially and a report is issued based on the presentations and discussions at the conference. The whole purpose of SOLEC is to provide an update and a forum for discussion on the current state of the Great Lakes ecosystem and the factors impacting it. Three SOLEC conferences have been held to date and an overarching recommendation from each has been the realization that standard indicators must be developed to be able to measure clearly and accurately the state of the lakes. In fact, the main theme of SOLEC '98 was *indicators*.

The SOLEC exercise has developed a list of 80 proposed indicators. This list is available on line at: www.cciw.ca/solec/ or www.epa.gov/glnpo/solec/98/. The State of the Great Lakes Report (U.S. EPA and Environment Canada 1999) presents the first attempt at

an indicator-based format, giving information on 19 of the proposed 80 indicators. The work of the SOLEC team and the work of the Lake Erie LaMP will be coordinated and consolidated to best address the needs of Lake Erie. Several other indicator-based initiatives, such as the IJC's Indicator Implementation Task Force and Ohio's Lake Erie Quality Index effort will be referenced as the Lake Erie LaMP proceeds.

9.3 Current and Proposed Habitat Actions in the Lake Erie Basin

Introduction

The 1995 Lake Erie LaMP Concept Paper identified habitat loss and degradation as one of three key stressors that must be addressed to restore Lake Erie. The 1999 Lake Erie LaMP Status Report reinforced this position by specifically identifying loss of wetlands habitat as a key issue. Wetlands, both coastal and inland, are ecologically, economically, and socially important to the overall health of the Lake Erie ecosystem. In addition, the loss of fish and wildlife habitat beneficial use impairment assessment reports identified impairments to the following habitat zones of Lake Erie: open waters, islands, tributaries, shoreline, and mesic and swamp forests.

Developing a Lake Erie LaMP Habitat Restoration and Protection Plan

In July 1999, the Lake Erie LaMP Management Committee made a commitment to begin the process of developing a LaMP Habitat Restoration and Protection Plan. Three things are needed to fully develop and prioritize LaMP habitat restoration and protection goals:

- Individual assessments of habitat conditions (i.e. plankton, benthos, fish and wildlife) must be integrated to determine where habitat degradation is impairing most or all of these groups;
- A clear understanding of the factors which control or limit the use of the remaining habitat to sustain healthy populations and their relative importance (i.e. contaminants, food web, direct human disturbance, etc.) must be outlined; and
- Objectives that identify the type of Lake Erie ecosystem that is both achievable and supported by Lake Erie agencies and the public must be identified.

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The current status of each of these needs is summarized below. Our current understanding of habitat conditions in Lake Erie, including key stressors, is integrated for the first time in Table 4.10 (see Section 4). Although key human-induced stressors have been identified, it is not always clear which of these factors is the driving force behind effective use of existing habitat and restoration of future habitat. Even for those stressors that are known to be driving the system, there are still many questions about how the stressors affect natural communities and species.

These questions were explored at the April 1999 Lake Erie at the Millennium Conference with the intent to develop a binational research agenda. The outcome of the conference was the identification of seven suites of ecological problems that require in-depth research. One of the seven suites was habitat. The next step of the Millennium Plan will be to convene a two to three day workshop to develop specific research proposals for Lake Erie habitat. The Lake Erie Millennium Conference conveners expect habitat to be the last of the seven workshops to be held, given the complexity of the issues involved.

Laying the Foundation

Only parts of the three items needed to complete a LaMP habitat action plan are currently available. Therefore, the LaMP 2000 approach is to focus on identifying and describing examples of both existing and proposed habitat projects. The intent of this report is to provide the information needed for LaMP agencies to:

- Knit together existing and proposed projects with identified habitat impairments and LaMP goals;
- Identify proposed projects that are ready to proceed, but need funding; and,

- Identify key gaps that existing and proposed projects will not fill.

To address the first bullet item, preliminary lists of ongoing and proposed projects are presented. *Existing projects* are those that are in progress or have been completed and meet the criteria outlined below even though they were not necessarily initiated with those criteria in mind. Eight of the projects listed are complete as noted in the project narratives. Second, *proposed projects* are those which are in the planning stages, or awaiting funding. In each project, a variety of resource needs are identified. The proposed projects represent the breadth of needs in the Lake Erie basin, but are not all-inclusive. Many additional projects will be needed to remove impairments. The two lists presented are by no means comprehensive. They represent the first attempt at compiling habitat project information. All of the existing and potential projects described in this section were selected as examples because they meet the preliminary screening criteria listed below:

The project:

- is leading to reduction or removal of impairment to beneficial use;
- has ecological benefits of significance to the Lake Erie ecosystem;
- has baseline data available that can be used to measure success of the project;
- is logistically and financially viable;
- has multiple partners interested;
- is relatively non-controversial; and,
- has information readily available within LaMP deadlines.

These criteria were used to identify projects that are currently most ready to proceed and relevant to the goals and objectives of the LaMP. Examples are included from across the Lake Erie basin, representing both aquatic and terrestrial work, and showing the extent of work in both urban and rural settings. Additional projects and a further prioritization of these projects will be forthcoming as the LaMP progresses, the loss of wildlife habitat assessment is completed, and new information comes to light.

Because there are many unanswered questions about Lake Erie habitat issues, a number of different types of projects are necessary to adequately address habitat restoration. A brief description of each type of project mentioned in this summary, and the question it is designed to answer is provided below.

Assessment/research: the first phase of work to determine local natural and human resources within a defined geographic area. What is the problem?

Inventory/classification: intensive data collection on specific species, communities, or historical and sociological information. What is the status of the resource?

New tool/technology demonstration: on-the-ground application of a new technology or tool on a small, local scale that has the potential for broad application in protection or restoration projects. What actions work or don't work to restore habitat?

Planning/coordination/collaboration: partnership building, evaluation of data or project progress, formulation of strategies for protection and restoration activities. What can we do together to solve the problem or continue restoration?

Protection: on-the-ground protection, management, and evaluation of progress of ecosystem processes and functions at a specific geographic area. What actions work or don't work to protect habitat from degradation that may eventually need restoration?

Restoration: on-the-ground restoration, enhancement, or remediation and evaluation of success in improving ecosystem processes and functions at a specific geographic area. What actions work or don't work to restore habitat?

Monitoring: the long-term measuring of the success of the project. Did the actions work?

Education/outreach: the communication of both status of the resource and success of the project to the public. What can the public learn about project activities and do about natural resource and habitat issues?

Summary Observations

Thirty-seven existing projects were identified for this report. Twenty-three of the 37 projects have an on-the-ground restoration component. The projects cover a wide range of habitat types including Carolinian forest, alvar, oak openings, river and tributary restoration, fish and mussel habitat, and bird habitat. A wide range of stressors to these habitats is represented as well, including: non-indigenous invasive species, nonpoint source pollution, and development pressures. Eight of the projects described have been completed. The remaining are ongoing or in progress. Each of the incomplete projects needs additional resources for completion that are listed at the end of the description. An exact determination of the monetary needs for these projects has not yet been compiled.

Nineteen proposed projects are included. Twelve of these have a strong restoration component. Many deal with agricultural lands and nonpoint source pollution. A few are concerned with non-indigenous invasive species. Others are concerned with fish habitat. Although several proposed projects have determined total cost to complete, all resource needs have not been compiled because many of the projects are in the preliminary planning stages.

The next steps are:

- Continue to compile examples of habitat projects that meet LaMP goals and are being implemented.
- Continue to compile proposed projects.
- Compare existing and proposed projects to the needs determined through the LaMP process.
- Collaborate to prioritize on future projects.

The following two tables, Table 9.1 and Table 9.2, provide a summary of the existing and proposed habitat projects that have been compiled to date. The projects are categorized by project type. Detailed descriptions of all the existing and proposed projects are listed in Appendix D.

Table 9.1 Summary of Examples of Existing Habitat Projects

TYPE OF PROJECT	Assessment/ Research	Inventory/ Classific.	New Tool/ Technology Demo.	Planning/ Coord/ Collab.	Protection	Restoration	Monitoring	Education/ Outreach
EXISTING PROJECTS								
1. Buffalo River, NY						x		x
2. Carolinian Reforestation, ON						x		
3. Cazenovia Creek, NY						x		x
4. Chagrin R., OH				x				
5. City of Trenton, MI						x		x
6. Sheldon Marsh, OH					x	x		
7. Conservation Farm Plan, ON						x		
8. Huron R., MI		x						
9. Conserving Alvar Habitats, OH		x			x			
10. Cummings Farm, ON						x		x
11. Cuyahoga River, OH			x			x		x
12. D'aubigny Creek, ON	x					x	x	
13. Detroit River Candidate Sites, MI	x	x						
14. Detroit River Lake Sturgeon, MI	x	x						
15. Conservation Ethic, OH								x
16. Biodiversity Essex Region, ON						x		
17. Friends of watersheds, ON				x	x	x		x
18. Grand River Lowlands, OH				x	x	x		
19. Great Lakes Greenness							x	
20. St. Clair Riv. Waterways, MI, ON				x		x		
21. Lake Erie Grasslands, OH						x		
22. Long-term wetlands NPS, OH	x							
23. Managing Agricultural Drains, ON						x	x	
24. Marsh Monitoring, ON	x						x	x
25. Migratory Bird Habitat, ON						x		
26. Nearshore Habitat Priorities, NY	x	x	x					
27. Ojibway Prairies & Savannas, ON					x			x
28. Penn Soil Riparian, PA						x		
29. Plant Community Survey, OH		x						
30. Portage R., OH						x		
31. Freshwater Unionid, OH						x		
32. Presque Isle, PA						x		
33. Oak Openings, OH			x			x		x
34. Springfield Township, MI				x				
35. St. Clair River Lakeplain, MI		x		x		x		
36. Toussaint R., OH						x		
37. Urban Dynamics, MI, ON	x	x						x

Table 9.2 Summary of Preliminary List of Proposed Habitat Projects

TYPE OF PROJECT	Assessment/ Research	Inventory/ Classific.	New Tool/ Technology Demo.	Planning/ Coord/ Collab.	Protection	Restoration	Monitoring	Education/ Outreach
PROPOSED PROJECTS								
1. Aquatic Renewal Program, ON				x		x		x
2. Atlas, MI, ON	x	x						x
3. Lake Trout Mercury, NY	x	x				x		
4. Caledonia Fishway, ON						x		
5. Detroit R. Eco Risk, MI	x	x						
6. Detroit R. GIS, MI	x	x						x
7. Detroit R. Soft Shore, MI						x		x
8. Ephemeral Wetlands Conf.								x
9. Lake Trout Mortality				x		x	x	
10. Lake Erie water snake, OH	x	x						
11. Hillman Marsh, ON						x		
12. Land Stewardship Incentive, ON						x		
13. Lower Trophic Levels, ON, States				x			x	
14. Conservation Reserve, ON						x		
15. Phragmites Control, ON	x					x	x	
16. Round Goby, NY, OH	x						x	
17. Rural Non-Point Source, ON						x		
18. Western L. ER CREP, OH						x		
19. Ashtabula NRDA				x		x		

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9.4 PCB Action Plan

9.4.1 Introduction

To date, the following beneficial use impairments have been identified in the Lake Erie basin due to PCBs:

- Majority of fish consumption advisories
- Wildlife consumption advisories for snapping turtles and waterfowl in New York State
- Human contact advisory in the Ottawa River (Maumee AOC) in Ohio
- Bird or animal deformities or reproduction problems particularly in mink, bald eagles, reptiles and amphibians
- Restrictions on dredging activities

For the above reasons, on May 1, 1998, the Lake Erie LaMP Management Committee designated PCBs as a critical pollutant for priority action. The GLWQA (1978 as amended 1987) defines critical pollutants as substances that persist at levels that, singly or in synergistic or additive combination are causing, or are likely to cause, impairment of beneficial uses despite past application of regulatory controls due to their: 1) presence in open lake waters; 2) ability to cause or contribute to a failure to meet Agreement objectives through their recognized threat to human health and aquatic life; or 3) ability to bioaccumulate (IJC, 1994). PCBs have been shown to meet all three of these criteria for Lake Erie. Additionally, in Lake Erie, 65 percent of all consumption advisories are because of PCBs. Mercury, as methyl-mercury, is the cause of the remainder of the advisories. Furthermore, in Lake St. Clair and the St. Clair and Detroit River, 40 percent of all consumption advisories are because of PCBs.

9.4.2 Current PCB Reduction Plans and Goals

Many efforts are being undertaken to reduce the level of PCBs in the environment, including or specifically in the Great Lakes basin and, consequently, Lake Erie. Examples of on-going mechanisms that coordinate and focus various regulatory, pollution prevention, and remediation programs are: the Commission for Environmental Cooperation's North American Regional Action Plan (NARAP) for PCBs involving Canada, Mexico, and the United States; the Great Lakes Binational Toxics Strategy (BTS) involving Canada and the United States; the Canada-Ontario Agreement Respecting the Great Lakes Basin Ecosystem (COA); and the Remedial Action Plans (RAPs) in the Great Lakes AOCs.

The relevant goals of the NARAP for PCBs are:

Virtual elimination of PCBs in the environment. Seek to achieve no measurable release of PCBs to the environment and the phase-out of PCB uses for which release cannot be contained. Strategies adopted for virtual elimination of PCBs should account for risks to human health and the environment, and should consider economic and technical factors. Environmentally sound management of PCBs throughout their life cycle should take into account usage, storage, domestic and transboundary movement, and treatment/disposal of PCBs.

The relevant goals of the BTS for PCBs are:

In the United States: Seek by 2006, a 90% reduction nationally of high-level PCBs (>500 ppm) used in electrical equipment. Ensure that all PCBs retired from use are properly managed and disposed of to prevent accidental releases within or to the Great Lakes Basin.

In Canada: Seek by 2000, a 90% reduction of high-level PCBs (>1 percent PCB) that were once, or are currently, in service and accelerate destruction of stored high-level PCB wastes which have the potential to enter the Great Lakes Basin, consistent with the 1994 Canada-Ontario Agreement (COA).

In both the U.S. and Canada: Complete or be well advanced in remediation of priority sites with contaminated bottom sediments in the Great Lakes basin by 2006. Assess atmospheric inputs of PCBs to the Great Lakes. If ongoing long-range sources are confirmed, work within international frameworks to reduce releases.

As a result of actions undertaken to date, the BTS has reported: In Canada, just over 50 percent of the high-level PCBs (>1 percent PCB) and about 23 percent of the low-level PCBs have been destroyed compared to the 1988 baseline, consistent with the Canada-Ontario Agreement (COA). U.S. EPA fully expects the U.S. challenge in the BTS for PCB reductions will be met by 2006. Significant reductions have already been and continue to be made based on discussions with the utility, steel, and automotive industries; required removal of PCBs as negotiated during settlements of cases involving violations of regulations; and continued activities at permitted storage and disposal facilities.

9.4.3 Current PCB Controls

PCBs were produced in the U.S. between 1929 and 1977. They were and continue to be used primarily as cooling liquids in transformers, capacitors and other electrical equipment. Past or historical applications of PCBs also included such uses as heat transfer and hydraulic fluids, plasticizers, surface coatings, and as dye carriers in inks, adhesives, and paints.

PCBs can be released to the environment from several sources including: contaminated sediments, leachate from old landfills and other environmental sinks of past PCB contamination; spills or leaks from accidents or gradual wear of transformers, capacitors, or other electrical equipment containing PCBs; uncontrolled combustion of materials containing PCBs; improper disposal of PCB-containing equipment or materials; and inadvertent generation during certain industrial processes involving carbon, chlorine and elevated temperatures.

Toxic Substances Control Act (TSCA) regulations in the U.S., and Canadian Environmental Protection Act (CEPA) regulations in Canada dictate restrictions on the

manufacture, sale, use, disposal, import and export of PCBs. The statutes also include provisions for allowable uses. In the U.S., PCB releases are also targeted by the Clean Air Act (CAA), Clean Water Act (CWA), Resource Conservation and Recovery Act (RCRA), and PCB releases are also reported in the Toxic Chemical Release Inventory (TRI). In Canada, the storage of PCBs is regulated under the Storage of PCB Material Regulations; the export and import of PCBs is regulated under the PCB Waste Export Regulations; and the chlorobiphenyl regulations control the manufacture, sale, use, and disposal of PCBs. In Ontario, PCBs are classified as no discharge substances. Therefore, in Ontario, no permits are given to discharge either substances to the environment.

As a result of all of these regulations, along with voluntary phaseouts and remediation, from the late 1970s to the early 1990s, PCB concentrations in the Great Lakes environment have declined. Despite the extensive regulations, PCBs continue to exist at levels that result in restrictions on fish or wildlife consumption. As a result, there is a need for continuing these controls and pursuing voluntary actions.

9.4.4 Summary of Known PCB Sediment Hotspots and Remedial Actions Underway

All 42 existing AOCs in the Great Lakes Basin have contaminated sediments. In approximately half of these AOCs, PCB contaminated sediments are a source of identified impairments to the ecosystem. Several of these sites contribute PCBs to the lakewide ecosystem and contribute to lakewide impairments. Much characterization work has been done at the AOCs and many tons of contaminated sediment have been removed. For example, recent U.S. sediment remediation projects dealing with PCB contaminated sediments within the Lake Erie basin have been completed and/or planned at River Raisin (27,000 yds³), the upper Rouge River (6,989 yds³), Newburgh Lake (400,000 yds³), Willow Run Creek (400,000 yds³), Monguagon Creek (25,182 yds³), the Ottawa River (10,000 yds³), the Trenton Channel in the Detroit River (20,000 yds³), Ashtabula Harbor (1,000,000 yds³), and the Fields Brook Superfund site.

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9.4.5 Future PCB Reduction Actions

Reducing levels of PCBs in the environment involves many different partners from governments, communities, environmental organizations and industries. As stated, efforts to reduce PCBs are already being undertaken at an international, national, regional, and local level. This section includes those actions that the Lake Erie partners have committed to undertake in the next two years or are proposed as doable in the next two years but for which funding is currently not available.

Table 9.3 lists specific actions that Canada and the U.S. are committed to undertake, primarily under the BTS within the next two years.

Table 9.3 Committed Actions for PCB Reduction

Committed Action (Funded)	Lead Agency or Funding Source
Pollution Reduction	
Work with automotive, iron and steel sector, and electrical facilities in the Lake Erie basin to establish voluntary commitments to reduce the use, discharge or emissions of PCBs.	EC and U.S. EPA
Continue to follow-up with Inland's commitment to reduce high level PCBs in electrical equipment by 95% by 2006 and eliminate PCBs that are present in hydraulic systems in their plants.	U.S. EPA
Coordinate LaMP and BTS efforts with all related partners in order to produce a cohesive, unified program to address PCBs in the Great Lakes.	EC and U.S. EPA
U.S. EPA Superfund commits to completing the remedies for Springfield Twp. Dump (MI); G&H Landfill (MI); Metamora (MI); and Fields Brook (OH), all of which PCB remediation is part of the cleanup by the end of FY 2002.	U.S. EPA
U.S. EPA will work with the states to incorporate the recently promulgated limits under 40 CFR part 503, for dioxin, PCBs and furans in land applied biosolids at 300 nanograms per kilogram to incorporate these limits in permits issued to generators and land appliers of biosolids.	U.S. EPA
Continue efforts with the Ashtabula River Partnership (ARP), U.S. EPA, US Army Corps of Engineers (USACE), and Ohio EPA to lead to the Remediation of Contaminated Sediments in the Ashtabula River and Harbor where dredging is to begin in 2002.	U.S. EPA, ARP, Ohio EPA, USACE
U.S. EPA will identify point source discharges of those pollutants of concern which are monitored by the NPDES permittees using the permit compliance system.	U.S. EPA
Continue to target inspections and enforcement and promote the removal of PCBs during settlement negotiations for enforcement actions.	U.S. EPA
Formalize the PCB Phasedown Program pilot project with the major utilities in the Great Lakes Basin that is designed to encourage the utilities to phase out their remaining PCB equipment.	U.S. EPA
Identify federally owned PCBs in the Lake Erie basin and seek their removal by the departments or agencies that own the PCBs.	U.S. EPA
Complete the PCB and mercury clean sweep pilot project that includes a component to collect PCB contaminated oil in the Great Lakes basin, treat the oil to remove the PCBs, and recycle PCB-free oil.	U.S. EPA
Information	
Finalize the PCB Sources and Regulations Background report. This report includes updated information regarding changes to the U.S. EPA PCB regulations, and new PCB data and updated information on PCB sources and regulations in Canada.	EC and U.S. EPA
Finalize PCB Options Paper under the BTS that identifies options that can be undertaken to reduce PCBs in the environment.	EC and U.S. EPA
Upgrade National PCB database of PCB electrical equipment through 1997 thereby improving its tracking capabilities.	EC
Report on an annual basis the status of sediment remediation at priority sites within the Lake Erie basin.	EC and U.S. EPA
Assess atmospheric inputs of PCBs to the Great Lakes. If on-going long-range sources are confirmed, work within international frameworks to reduce releases.	EC and U.S. EPA
U.S. EPA Superfund commits to completing maps of the Great Lakes shoreline using GIS technology that include detailed data on location of sensitive species, tribal lands, natural areas and managed lands, economic resources and potential spill sources.	U.S. EPA
U.S. EPA Superfund commits to working with the LaMP/RAP partners on site assessment work to identify potential new sites in the Lake Erie Basin.	U.S. EPA
U.S. Geological Survey, Biological Resources Division, Great Lakes Science Center Grant-Monitoring Trends of Selected PCB Congeners and Pesticides in Great Lakes Predator Fish Collected during 1994-1997.	U.S. EPA
Coordinate LaMP and Binational Toxics Strategy efforts with all related partners in order to produce a cohesive, unified program to address PCBs in the Great Lakes.	U.S. EPA
Promote the application and use of a computerized, searchable and user-friendly Sediment Technology Directory (GLOBETECHS) of 250 innovative technologies for the safe handling and treatment of contaminated sediments.	EC
The Ontario Ministry of the Environment continues to maintain a current electronic database of on-site PCB waste storage sites and makes the information publicly available on a regular basis (presently current to mid-1999).	MOE

The following table includes actions that have been proposed by Canada and the U.S that could be accomplished in the next two years if funding were made available.

Table 9.4 Proposed Actions for PCBs

Proposed Action	Lead Agency
Pollution Reduction	
<ul style="list-style-type: none"> - Organize Small PCB owner workshops in the Lake Erie Basin to exchange information on PCB management, decommissioning and destruction. The expected outcome for these workshops would be to: <ul style="list-style-type: none"> - Encourage owners of PCB bearing equipment to monitor and document the on-going status of the equipment until the equipment is removed; - Encourage PCB owners to destroy PCBs in use or storage; - Encourage owners of transformers and capacitors to test their equipment to identify any remaining PCBs; - Identify and highlight licensed PCB destruction capacity for low level PCB containing materials; - Provide information on the renewal of the Canadian Environmental Protection Act ; - Encourage PCB Amentors (facilities that have already removed their PCBs) to assist in smaller facilities that do not have access to as much environmental expertise. - Cooperation will be promoted so that PCB owners can reduce the cost of contracted PCB services (i.e. treatment of PCB contaminated mineral oil, on-site decontamination of capacitors and transformers, shipment of PCBs to high temperature incineration facilities). 	EC and MOE
- Encourage PCB owners to destroy PCBs in use or storage	U.S. EPA
- Encourage PCB Amentors (facilities that have already removed their PCBs) to assist in smaller facilities that do not have access to as much environmental expertise.	U.S. EPA
- Continue to implement remediation of PCB contaminated sediments in the Ashtabua River AOC.	Ohio EPA, U.S. EPA, ARP, USACE
- Continue to target grant funds for reduction of PCBs	U.S. EPA
Information	
- Collect data on reductions of PCB electrical equipment from the major electric utilities in the Great Lakes basin which are participants in PCB Phasedown Program and track the progress of the reductions.	U.S. EPA
- Compile data on PCBs remaining in use and in the environment in the Lake Erie Basin.	U.S. EPA

More detailed project descriptions are presented in Appendix E.

9.4.6 Conclusions

Much work has been done and will continue in order to eliminate the environmental threat from PCBs. Stakeholder participation is key to realizing success in the reduction of PCBs, particularly on issues involving long-term planning for the phase out of PCBs, management options, incentives, and the benefits of PCB reduction. Implementation of the committed and proposed actions will contribute to reducing sources of PCBs and presumably levels in the environment. The LaMP will be instrumental in monitoring the lake's response to recently completed projects as well as these on-going and proposed future actions.

9.4.7 References

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Long-range Transport of Pollutants of Concern. Delta Institute, 1999. Based on OMB Draft Deposition of Air Pollutants to the Great Waters, 3rd Report to Congress, August 11, 1999 and Draft Atmospheric Deposition of Toxics: Integrating Science and Policy, Delta Institute, October 1999.

Realizing Remediation, A Summary of Contaminated Sediment Remediation Activities in the Great Lakes Basin. GLNPO, March 1998.

Remediation of Contaminated Sediments at the Unnamed Tributary to the Ottawa River Summary Report, January 2000. Prepared by Blasland, Bouck & Lee, Inc. for the U.S. EPA/GLNPO, Ohio Environmental Protection Agency and City of Toledo.

9.5 Mercury Action Plan

9.5.1 Introduction

Mercury is used in industries worldwide because of its distinctive properties. It conducts electricity, acts as a biocide, is useful in measurement of temperature and pressure, and forms alloys with almost all other metals. With these and other properties, mercury plays an important role in several industrial sectors (*Mercury Draft Sources and Regulations 1999 Update*).

On May 1, 1998, the Lake Erie LaMP Management Committee designated mercury as a critical pollutant for priority action, based on the number of fish consumption advisory impairments caused by this chemical. In Lake Erie, 35 percent of all consumption advisories are due to mercury, with the remaining percent due to PCBs. In Lake St. Clair and the St. Clair and Detroit Rivers, 60 percent of all consumption advisories are due to mercury. As of 1997, there were mercury advisories in three western basin tributaries, four central basin tributaries, and one bay and open waters of the Ontario eastern basin as well as Long Point Bay.

Much of the mercury entering the waters of the region settles from the air or is deposited in rain or other precipitation. In the ambient air, mercury levels are not dangerous; it is the cumulative amount of mercury deposited to water bodies and its subsequent chemical transformation to methyl-mercury that creates problems. Fish absorb and retain methyl-mercury, causing it to bioaccumulate until it is concentrated up to millions of times above the level in the surrounding water, particularly in older, predatory fish.

There are many sources of mercury in the environment. Although natural sources of mercury exist, recent research suggests that background concentrations of this metal in the atmosphere and sediments have increased by a factor of two to five since pre-industrial times. This suggests that anthropogenic sources have significantly increased mercury levels in the environment. The continuing presence of mercury in the environment is the result of atmospheric deposition, contaminated sediments and other nonpoint sources. (BTS)

While air deposition is the largest current source of mercury, sediments contain the greatest mass of mercury in the system. Mercury enters the atmosphere through the mobilization or release of geologically bound mercury by natural processes and human activities. Mercury is also re-emitted to the atmosphere by biological and geological processes drawing on a pool of mercury that was deposited to the earth's surface after initial mobilization by either human or natural activities. In addition to local anthropogenic mercury sources, Lake Erie receives mercury deposition as the result of inputs from the global reservoir of atmospheric mercury emitted by natural sources and global anthropogenic sources. Mercury can be intentionally released as in production processes or consumer products, or incidentally released from energy production, mobile sources or manufacturing processes.

Mercury (Hg) has been studied more than most toxic pollutants relative to long range transport. The global reservoir of Hg is estimated to contribute 40 percent of the total Hg deposited to the U.S. mainland. This makes mercury a primary focus of long-range transport

and fate research for U.S. EPA. U.S. EPA's Mercury Report to Congress (1997) noted the 1994-1995 mercury contribution from U.S. anthropogenic sources to the atmosphere was 158 tons, of which 87 percent was from combustion sources (waste incineration, utility fossil fuel plants). Estimated total annual input from all mercury sources was 5,500 tons worldwide, indicating that U.S. anthropogenic sources represent only three percent of global releases in 1995. Fifty-two tons (thirty percent) of U.S. source emissions of mercury are deposited within the U.S. borders, while the remainder is deposited to the global reservoir (107 tons). Depositional input to the U.S. from non-U.S. sources of mercury was estimated at 35 tons. Computer simulation on which these estimates were developed has recognized uncertainty that needs to be resolved by additional data; nevertheless, it appears that the solutions to the mercury problem will require international effort (Delta Institute, 1999).

9.5.2 Current Mercury Reduction Plans and Goals

As stated in the Great Lakes Binational Toxics Strategy (BTS), Environment Canada (EC) and the United States Environmental Protection Agency (U.S. EPA), in consultation with other federal departments and agencies, Great Lakes states, the Province of Ontario, Tribes and First Nations, will work in cooperation with their public and private partners toward the goal of virtual elimination of persistent toxic substances resulting from human activity, particularly those which bioaccumulate, from the Great Lakes basin, so as to protect and ensure the health and integrity of the Great Lakes ecosystem. The anthropogenic sources of pollution will be targeted, when warranted, for reduction through a life-cycle management approach so as to achieve naturally-occurring levels. The primary emphasis will be on pollution prevention.

In addition to pollution prevention, the following goals are targeted:

- For the U.S., seek by 2006 a 50 percent reduction nationally in the deliberate use of mercury and a 50 percent reduction in the release of mercury from sources resulting from human activity. The release challenge will apply to the aggregate of releases to the air nationwide and of releases to the water within the Great Lakes basin. This target is considered as an interim reduction target and, in consultation with stakeholders and new information, will be revised if warranted. Between 1990 and 1995, there was an estimated 25 percent reduction in U.S. air mercury emissions. Although estimates are uncertain, we are confident that there has been a significant decrease, particularly in incinerator emissions, and that these reductions have continued beyond 1995. Between 1995 and 1997, there was a 21 percent reduction in mercury use.
- For Canada, seek by 2000 a 90 percent reduction in the release of mercury, or where warranted the use of mercury, from polluting sources resulting from human activity in the Great Lakes basin. This target is considered as an interim reduction target and, in consultation with stakeholders and new information will be revised if warranted. It is currently estimated that there is close to an 80 percent reduction. (BTS)
- Assess atmospheric inputs of mercury to the Great Lakes. The aim of this effort is to evaluate and report jointly on the contribution and significance of long-range transport mercury from worldwide sources. If ongoing long-range sources are confirmed, work within international frameworks to reduce releases of such substances.
- Complete or be well advanced in remediation of priority sites with contaminated sediments in the Great Lakes basin by 2006.

9.5.3 Current Mercury Controls

Mercury releases are regulated under numerous statutes, under the jurisdiction of multiple agencies. Regulations developed to control the release of mercury into the environment can have either direct or indirect effects on sources of mercury. Use or release-related regulations have a direct effect on sources of mercury or release of mercury into the environment. These regulations specify, for individual mercury sources, the amounts or concentrations that can be released to the environment, and the ways mercury may be used, transported, and disposed of, all of which influence the costs associated with using or

releasing mercury. Environmental management standards, have an indirect effect on individual sources and are numeric criteria that specify a maximum acceptable mercury concentration for different media, based on scientific or risk-based criteria. For instance, mercury standards exist for water, sludge, fish tissue, drinking water, and several other media. These standards provide a yardstick against which to measure the effectiveness of mercury release regulations. There are also reporting requirements, such as the U.S. Toxics Release Inventory (TRI), the Canada National Pollution Release Inventory (NPRI), and U.S. EPA Requests for Information, to enhance public awareness of mercury releases and aid in the crafting of regulations. Further information on specific regulations can be found in the *BTS Draft Report Mercury Sources and Regulations, 1999 Update* document at <http://www.epa.gov/bns/mercury/>.

U.S. EPA regulates mercury content in pesticides, and mercury releases into the environment through air, water, and land disposal limits. The Food and Drug Administration (FDA) regulates mercury in cosmetics, food, and dental products. The Occupational Safety and Health Administration (OSHA) regulates mercury exposures in the workplace. In addition to regulations governing mercury release, there are regulations limiting the use of mercury. In Canada, regulatory programs which address mercury include: the Canadian Environmental Protection Act, the Fisheries Act, the Canadian Environmental Assessment Act, the Pest Control Products Act, the Ontario Environmental Protection Act, the Ontario Water Resources Act, the Ontario Environmental Assessment Act, and an array of other federal and provincial acts that address protection of the Great Lakes basin ecosystem from the polluting effects of all targeted toxic substances. In Ontario, mercury is classified as a *no discharge* substance; therefore, no permits are given to discharge mercury into the environment. In the U.S., regulatory programs which address mercury include the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), the Resource Conservation and Recovery Act (RCRA), the Clean Water Act, the Clean Air Act, the Toxic Substances Control Act (TSCA), the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA), and other regulatory programs. (BTS)

These existing regulations have encouraged a dramatic decline in mercury use, and have begun to lead to reductions in releases as well. In the U.S., new Maximum Available Control Technology (MACT) Standards are expected to result in further drops in mercury releases. Many additional regulatory and voluntary efforts to reduce mercury, particularly in states that have identified local fish contamination problems, are underway due to public concern.

9.5.4 Summary of Known Mercury Sediment Hotspots and Remedial Actions Underway

A study of historic sediment samples by Pirrone *et al.* (1998) reported that air deposition was found to be a major contributor of mercury to the Great Lakes as indicated by sediment core analysis of mercury deposition rates over time. Atmospheric deposition flux in the Great Lakes was estimated to be almost an order of magnitude higher than the background to the whole of North America (Delta Institute, 1999). Sediments, for the most part, are contaminated due to historic (pre-1970s) practices. Point source loadings to sediments have decreased dramatically and are basically under control. Sediments are both a sink and a source of contamination. The BTS has a commitment to have completed or be well advanced in addressing contaminated sediments by 2006.

Fish are exposed to mercury through sediments. Sediments downstream from historic chlor-alkali plants tend to have the highest mercury levels. There have been numerous studies that document the elevated levels of methyl-mercury in freshwater fish across the northeast U.S. and Canada. Mercury levels in freshwater fish have been monitored in the northeast U.S. since the 1970s. The results of these monitoring programs indicate that levels of mercury significantly exceed acceptable values in fish species from certain water bodies in the region. In the Lake Erie basin, fish consumption advisories due to mercury exist in Ontario waters of the eastern basin, in Long Point and Rondeau Bays, and in nine tributaries. Mercury is the chemical that drives the advisories for the Sandusky, Chagrin and Ashtabula rivers in Ohio. Pregnant women, women of childbearing age, and children are at particular risk because the developing nervous system of fetuses and children are very sensitive to the toxic effects of mercury.

Data on U.S. sites analyzed in 1996 showed high concentrations of mercury in bed sediment were found in the Trenton Channel of the Detroit River and at the mouth of the Little Cuyahoga River near Akron, Ohio. At these locations, detected concentrations ranged from 6.06 to 16.0 mg/kg and were from 12 to 32 times greater than the Probable Effects Level (PEL) and from three to eight times greater than the Severe Effects Level (SEL). Other locations with concentrations of mercury in bed sediments greater than the PEL (listed in decreasing concentrations) were the mouth of River Raisin, Michigan; Lake St. Clair; Monroe Harbor and out into Lake Erie; the mouth of the River Rouge, Michigan; and the mouth of the Clinton River, Michigan (USGS, in preparation).

St. Clair River:

In 1977, 1985 and 1990, on the Ontario side, the highest mercury concentrations in the river sediments (58, 51 and 16 mg.kg-1 or ppm, respectively) were found in the upper river, near or downstream of Dow Chemical (OMOE, 1979; St. Clair River RAP Team, 1991; Geomatics International, 1993). A comparison of stations sampled in both 1990 and 1994 by the Ontario Ministry of the Environment revealed that, although the average mercury level decreased from 4.7 to 2.8 mg.kg-1 respectively, this change was not significant ($p > 0.05$) (Farara & Burt, 1997). Furthermore, this comparison does not include sampling at additional (new) locations in 1994, which found surface sediment concentrations of mercury as high as 163 mg.kg-1 in the Dow area (Kauss & Nettleton, 1999). The latter is the highest known sediment mercury level in the Lake Erie basin. This is of concern since sediments in this area of the St. Clair River nearshore are subject to high rates of resuspension and downstream transport (St. Clair River RAP, Experimental Study of Deposition and Erosion on St. Clair River Sediments, 1997).

Lake St. Clair:

Historically sediment levels are less contaminated than tributaries. Recent 1998 sediment data from Michigan Combined Sewer Overflows (CSOs) in Lake St. Clair point to localized sources of heavy metals. Assessment of these potential sites is warranted, as is assessment of the area near the head of the Detroit River. *Note:* In the summer of 2000, the MDEQ and EPA/GLNPO plan to conduct joint monitoring in the St. Clair River (25-75 sites) and Lake St. Clair. Additionally, the Macomb County Health Department is planning on partial grid sample network from the shipping channel of Lake St. Clair to the U.S. mainland (about 100 grab surface samples). The focus for of these surveys is mercury.

Detroit River, including Trenton Channel:

The Ontario Ministry of the Environment's (OMOE) 1991 sediment quality and benthic invertebrate community study identified a number of areas in the river with impaired sediment quality and benthic invertebrate communities. These were largely concentrated along the Michigan shoreline, i.e., near Detroit, the Rouge and Ecorse River discharges, and in the Trenton Channel (Farara & Burt, 1993). The three highest surface sediment mercury concentrations were found adjacent to the Detroit shoreline (9.5 mg.kg-1), downstream of the Ecorse River discharge (11.7 mg.kg-1) and in the Trenton Channel, downstream of Firestone Steel (5.0 mg.kg-1).

Comparison of the 1991 sediment data with an earlier OMOE study showed that the average mercury concentration in U.S. sediments of the Detroit River did not change significantly ($p > 0.05$) from 1980 (0.62 mg.kg-1) to 1991 (0.81 mg.kg-1). The average of Canadian sediments increased slightly (but not significantly) from 1980 (0.19 mg.kg-1) to 1991 (0.24 mg.kg-1) (Farara & Burt, 1997).

The worst mercury contamination is along the Michigan mainland side in depositional pockets of fine silt in relation to historic discharges and industrial activity, mostly in the Trenton Channel. MDEQ-SWQD along with U.S. EPA-GLNPO and Region 5 has assessed the entire stretch of river. The report for the Trenton Channel is complete. The report for the rest of the river will be completed soon (data available).

Approximately 1,000,000 cubic yards of extremely contaminated sediments exist in this system. MDEQ is moving forward with a remediation of an orphan site (Black Lagoon) in 2000 using conventional CDF disposal, and an innovative sediment treatment

demonstration. Potentially responsible parties for other Trenton Channel and Detroit River sites are known.

The MDEQ plans on developing plans and specifications for remediation of all sites in conjunction with the USACE Detroit District. The Contaminated Sediments Action Team of the Detroit River RAP is an active stakeholder group (see: <http://cosat.homepage.com>).

Rouge River (from turning basin to Detroit River):

This area has been completely assessed by MDEQ and U.S. EPA. A report is in draft form. There is approximately 1,000,000 cubic yards of extremely contaminated material in this stretch. Plans and specification for remediation will be developed with USACE (cost share). Other initiatives include sediment-related work MDEQ-SWQD is doing with the USACE, GLNPO and Region 5.

Western Lake Erie

Western Lake Erie is the immediate receptor of Detroit River contaminant discharges, and a number of stations in this basin have been sampled over the years by the OMOE. Surface sediment data from these 11 stations indicates a significant ($p < 0.05$) decrease in average mercury concentrations between 1970 (1.1 mg.kg⁻¹) and 1991 (0.22 mg.kg⁻¹) (Beak Consultants, 1993). Continued sampling at one of these stations shows that since 1991, the decline has been slower and also somewhat variable.

Table 9.5 Lake Erie LaMP Mercury Reduction Actions and Lead Agency/Organization

COMMITTED (FUNDED) ACTIONS FOR MERCURY	LEAD AGENCY OR FUNDING SOURCE
Establish a household hazardous waste collection facility to collect and recycle household products containing mercury in the Cities of London and Waterloo (requires strategic alliance with both municipalities).	EC
Provide Pollution Prevention training at hospitals in London, Ontario with emphasis on the removal of mercury containing devices.	EC
Promote to school boards in the Lake Erie basin a mercury stewardship school curriculum program. (Pilot being developed in the Toronto School Board)	EC
The P ³ ERIE Partnership GLNPO Grant: The P ³ ERIE partnership has successfully worked on practical projects and educational efforts throughout the grant period. P ³ ERIE's successes have gained media attention and the P ³ ERIE partners are pleased with project results and positive spin-offs from the project. P ³ ERIE's partnership efforts have occurred. (See appendix for specific amounts of mercury reductions)	Pennsylvania DEP, Gannon University, P ³ Erie Partnership. Funded by U.S. EPA-GLNPO
Detroit Water and Sewerage Department (DWSD) PCB/Mercury Minimization Program: The DWSD has undertaken a number of special programs to effectively control mercury in hospitals, dental practices, industrial laundries, laboratories, and households. DWSD has initiated an Atmospheric Deposition Study, made revisions to its Local Limits Ordinance, and established an Education/Outreach Program for the general public.	DWSD
Lake Erie Basin	
Promote the Great Art for Great Lakes Virtual Classroom, with its mercury millennium theme, in primary schools within the Lake Erie basin - www.cciw.ca/glimr/classroom .	EC
U.S. EPA will continue its work on hazardous waste management in the western basin of Lake Erie. To support the mercury reduction effort to reduce the use and release of bio-accumulative toxic compounds, U.S. EPA will commit extramural funds to support RCRA corrective action efforts.	U.S. EPA
Continue the implementation of the Elemental Mercury Collection and Reclamation Program (www.epa.state.oh.us/dist/nwdo/er/mercury.htm).	State of Ohio U.S. EPA
For RCRA treatment, storage and disposal facilities, U.S. EPA Region 5 will consider emphasizing pollution prevention components in Consent Agreements and Consent Orders Supplemental Environmental Projects (SEPs). Implementation of this approach will be based on a case by case determination.	U.S. EPA
By April 2002, finalize a U.S. EPA Total Maximum Daily Loads (TMDL) Strategy for mercury reduction in Lake Erie *(see Appendix G for discussion of TMDLs).	U.S. EPA and States
U.S. EPA Superfund commits to working with LaMP/RAP partners on site assessment work to identify potential new sites in the Lake Erie basin.	U.S. EPA
A mercury reduction strategy is being developed for Ohio.	Ohio EPA
Support of Ohio Hazardous Waste Removal Program to properly remove, dispose of, or recycle hazardous and explosive chemicals from school chemistry labs.	Ohio Environmental Education Fund (OEEF)
Collection of 98% pure mercury from Ohio dentists	Ohio Dental Assoc. OEEF
Great Lakes Basin	
U.S. EPA (Air and Radiation Division) has committed funds to support mercury research in a number of priority areas including transport, transformation and fate; and human health and wildlife effects of methyl-mercury	U.S. EPA
U.S. EPA filed civil complaints against seven electric utility companies operating coal-fired power plants in the Midwest and Southeast	U.S. EPA
By December 2000, EPA (Air and Radiation Division) will make a determination about whether to regulate mercury emissions from electric utilities.	U.S. EPA
Michigan Department of Agriculture: Michigan Mercury Manometer Disposal Grant-The grantee will use grant funds to replace mercury manometer gauges used on dairy farms with non-mercury gauges. Mercury gauges will also be collected from inactive dairy farms. Project Period: 10/1/99 to 9/30/00	U.S. EPA-GLNPO
Michigan Department of Agriculture: Michigan Clean Sweep Grant - This Clean Sweep program shall remove and dispose of old, unwanted, suspended, or canceled pesticides from the agriculture community, industry, and homeowners in Michigan at no fee to the end-user. Project Period:10/1/99 to 9/30/00	U.S. EPA-GLNPO

COMMITTED (FUNDED) ACTIONS FOR MERCURY	LEAD AGENCY OR FUNDING SOURCE
University of Wisconsin: Mercury Education Program for Schools Grant. This project will focus on developing, adapting, and disseminating high-quality mercury related educational materials for schools. The focus will be on reducing the use of mercury in the school, in students' homes, and in the communities of participating schools throughout the Great Lakes basin. Project Period: 10/1/99 to 9/30/00.	U.S. EPA-GLNPO
Indiana University: Deposition of toxic organic compounds to the Great Lakes: The Integrated Atmospheric Deposition Network Grant-This agreement will provide funds for the sixth year of operation and maintenance of the Integrated Atmospheric Deposition Network (IADN) by Indiana University. Project Period: 1/22/99 to 1/22/00	U.S. EPA-GLNPO
Integrated Atmospheric Deposition Network Quality Assurance and Quality Control Program Grant. The Great Lakes National Program Office (GLNPO) is collaborating with Environment Canada to implement the binational Integrated Atmospheric Deposition Network (IADN) as mandated by Annex 15 of the Great Lakes Water Quality Agreement and Section 112(m) of the Clean Air Act. Project Period: 10/1/99 to 9/30/01.	U.S. EPA and EC
U.S. Army Corps of Engineers - Great Lakes and Ohio River Division: Sediment Assessment and Remediation Support Grant -This amendment to the existing interagency agreement augments the existing funds for procuring the support of the U.S. Army Corps of Engineers in the collection and analysis of sediment samples, review of feasibility studies and remediation design plans, and other technical support for sediment assessment and remediation studies. Project Period: 12/01/98 to 9/30/00.	U.S. EPA-GLNPO
By the end of 2000, the U.S. EPA will work with states to develop a permitting strategy consistent with the Clean Water Act for reducing loading of mercury from industrial, municipal, and storm water sources to further the goals of the LaMP.	U.S. EPA
U.S. EPA will identify point source dischargers of mercury which are monitored by NPDES permittees using the permit compliance system and commit to share this information with the wastewater treatment plants, industry, tribes and other contributors of mercury to the extent they are relevant sources of these pollutants. U.S. EPA will also inform states and regulated communities about sources of unregulated pollutants of concern and share available information regarding potential substitutes and waste minimization strategies.	U.S. EPA
U.S. EPA is committed to continuing to require compliance with numeric water quality standards and technology based pollutant limits.	U.S. EPA
U.S. EPA Region 5 will support the rigorous development and refinement of the Regional Air Toxics Emissions Inventory of all hazardous air pollutants, including those of concern to the Great Lakes and other inland water bodies and which have a tendency to bioaccumulate. U.S. EPA will work closely with all eight Great Lakes states to assure every possible known source of all magnitudes of emissions are identified and that good emission estimates are developed and updated to reflect implementation of control technologies and progress in emission reductions for input to air dispersion and deposition models.	U.S. EPA
U.S. EPA commits to ensuring that all Region 5 states will have enforceable regulations and the permit applications that are required to be submitted for municipal waste combustors and for hospital/medical/ infectious waste incinerators by December 2000. U.S. EPA commits to pursuing a strategy for assuring 100 percent compliance with these regulations. This strategy will involve close coordination including an effort to expedite state rulemaking as appropriate.	U.S. EPA
U.S. EPA commits to providing technical assistance to at least two generators of biosolids containing the highest permissible concentration of mercury in their biosolids with the objective of assisting the generators in identifying sources of mercury and reducing mercury in their biosolids.	U.S. EPA
On January 24, 2000, the Ministry of the Environment announced new provincial emission limits (caps) plus a monitoring and reporting program for the power generating industry in Ontario, including the two facilities (Lambton, Nanticoke) located in the Lake Erie basin. Mandatory reporting of broad range of emissions (including mercury) to the Ministry will be instituted as of May 2000 (see www.ene.gov.on.ca/envision/news/00600mb.html).	OME
The Ontario Ministry of the Environment is working to set new emissions performance standards for mercury emissions from the coal-fired power plants including those located in the Lake Erie basin (Lambton, Nanticoke). These Canada-wide standards are being set in conjunction with the other Provinces, the Territories and the Federal Government (see www.ccme.ca/3e_priorities/3ea_harmonization/3ea2_cws/3ea2.html).	OME
Draft emissions standards have recently been announced (November 1999) by the Ontario Ministry of the Environment that would affect several point sources of mercury in the Lake Erie basin.	OME

COMMITTED (FUNDED) ACTIONS FOR MERCURY	LEAD AGENCY OR FUNDING SOURCE
As of early 2000, federal, provincial and territorial environment departments are investigating the releases of mercury to the environment from various commercial products and some forms of wastes. A focus on dental amalgam, fluorescent lamps and sewage sludge that is land-applied is expected to result in Canada-wide standards in late 2000.	OME
The Ontario Ministry of the Environment along with Environment Canada have been working with the Ontario Dental Association to develop a "best management practices" document for dentists, scheduled for completion in May 2000.	OME
Information	
Locally Based	
The Detroit River RAP Pollution Prevention Action Team will take a lead role to advance many of the voluntary pollution prevention programs within commercial, industrial and residential areas, as well as support other River stakeholders' implementation of other programs.	Detroit RAP
State University of New York at Buffalo: A Mercury Screening Model for Lake St. Clair-This grant will support the development of a model for the transport and fate of mercury in Lake St. Clair, where mercury is a well documented problem. Project Period: 09/1/99 to 2/28/01.	U.S. EPA-GLNPO
The Pollution Prevention Team organized by Ohio EPA-NWDO will continue to promote pollution prevention efforts in northwest Ohio	Ohio EPA
Provide cost and management procedural information to the city of Windsor on how to establish a municipal collection depot for mercury containing devices.	EC
Lake Erie Basin	
Report on an annual basis, the status of sediment remediation at priority sites within the Lake Erie basin.	EC and U.S. EPA
If on-going long-range sources of mercury to the Great Lakes are confirmed, work within international frameworks to reduce releases.	EC and U.S. EPA
The Michigan Mercury Pollution Prevention task force has accomplished: a household hazardous waste collection program in 22 counties (sponsored by the MDEQ), resulting in the collection of 200 pounds of mercury; distributed 16,000 copies of the "Merc Concern" brochure throughout Michigan; developed a mercury pollution prevention web page at www.deq.state.mi.us/ead/p2sect/mercury and, distributed mercury outreach materials to science teachers.	Michigan and U.S. EPA
Agencies will work with facilities in the Lake Erie basin to establish voluntary agreements to reduce the use, discharge or emissions of mercury.	U.S. EPA and Michigan
Delta Institute: Creation and Dissemination of Targeted Fish Advisory Materials and a Forum Website in Cooperation with the Lake Erie Binational Public Forum. The project will continue creating and making available an easy-to-read and culturally sensitive fish advisory brochure. The advisory work will alert at-risk families, both low-income and minority, in the Lake Erie Basin to the dangers of contaminated fish consumption and will also provide positive alternatives for cooking, cleaning and selecting fish in order to decrease risk. (www.erieforum.org).	U.S. EPA
EPA Superfund commits to completing maps including data on location of sensitive species, tribal lands, natural areas and managed lands, economic resources and potential spill sources and providing these maps to LaMP/RAP partners by the end of FY 2002.	U.S. EPA
Great Lakes Basin	
Ohio's Office of Pollution Prevention will produce two fact sheets that focus on ways to reduce mercury and other PBTs.	Ohio EPA
U.S. EPA Office of Water has developed a Clean Water Action Plan, identifying non-point sources including atmospheric deposition as the most important threat to water quality.	U.S. EPA
EPA will continue to focus on research efforts and potential regulation of mercury emissions from coal-fired utilities.	U.S. EPA

COMMITTED (FUNDED) ACTIONS FOR MERCURY	LEAD AGENCY OR FUNDING SOURCE
Great Lakes United, Inc.: Clean Production Project for Basin Communities. GLU will support and develop a Great Lakes “clean car campaign”, and promote dioxin and mercury reduction in medical waste disposal. Project Period: 10/1/99 to 9/30/00	U.S. EPA-GLNPO
U.S. Navy, Great Lakes Naval Station, Naval Dental Research Institute: Mercury Removal from the Dental-Unit Waste Stream-The interagency agreement provides funds to the Naval Dental Research Institute to examine the mercury removal from the dental-unit wastewater stream. Project Period: 9/1/99 to 8/31/00.	U.S. EPA-GLNPO
The Delta Institute: Sector Based Pollution Prevention -The Delta Institute will focus on achieving toxics reductions through commitments from private and public sector owned and operated energy production units. Project Period: 9/1/99 to 9/30/00.	U.S. EPA-GLNPO
National Wildlife Federation: Local & Sector-based Pollution Prevention in the Binational Strategy- The National Wildlife Federation will focus on 1) building on existing efforts to implement pollution prevention, by way of sector-based strategies; and 2) coordinated Environmental Non-Governmental Organization participation in the Binational Toxics Strategy. Project Period: 10/1/99 to 9/30/00.	U.S. EPA-GLNPO
Ohio Healthy Hospital Pollution Prevention Initiative. A formal agreement has been signed with the Ohio Hospital Association (OHA) to develop and implement a strategy to virtually eliminate mercury containing waste from the health care industry's waste stream.	Ohio EPA and OHA
U.S. EPA will assist utilities in developing mercury control technology. Assistance may or may not take the form of funding.	U.S. EPA
U.S. EPA will encourage pollution prevention projects at hospitals, clinics, and medical, and veterinary offices with an emphasis on removing mercury and making the offices “mercury free.” U.S. EPA is working with AHA to virtually eliminate mercury from hospital waste.	U.S. EPA
U.S. EPA will encourage proper management of dental wastes that contain mercury.	U.S. EPA
U.S. EPA Great Waters Program- an ongoing program involving research and reporting requirements related to the atmospheric deposition of hazardous air pollutants to the “great waters” which include the Great Lakes.	U.S. EPA
The U.S. EPA will track disposition and status of the U.S. Federal Government's mercury stockpiles.	U.S. EPA
Agencies will assist schools in seeking out and disposing of mercury on school property.	U.S. EPA and Michigan
The Great Lakes Binational Toxics Strategy should be pursued to meet the short-term, interim goals (e.g. 50% reduction in mercury deposited from U.S. sources by 2006 and, for Canada, a 90% reduction in the release of mercury from polluting sources by 2000).	U.S. EPA and EC
Michigan will evaluate and begin the development of purchasing policies to eliminate use of products that might include mercury equipment (e.g. buildings, vehicles, and laboratory equipment). Policies will also examine phase-out of existing mercury containing items.	Michigan
Michigan agencies will evaluate a variety of economic incentives or disincentives to promote verifiable or innovative reductions. Possible incentives include early reduction credits, tax relief, low-interest loans, grants, rebates and bounties for achievers. Possible disincentives include fees, taxes or caps on mercury bearing products or uncontrolled sources of any of the nine designated chemicals.	Michigan
Michigan agencies will encourage home and industry energy audits.	Michigan
Michigan agencies will work with operators of medical waste incinerators to pursue reductions of mercury, dioxin and hexachlorobenzene through source reduction elimination/segregation, including the removal of noninfectious waste from the incinerator waste stream.	Michigan
Michigan agencies will support partnerships with dental associations to develop training materials and programs for dental offices regarding the proper handling, collection, and disposal of amalgam wastes.	Michigan
Sampling will begin in 2000 for the National Study of Chemical Residues in Lake Fish Tissue, a new effort to develop a National picture of the distribution of a variety of potential fish contaminants in the Nation's lakes. Bioaccumulative organic chemicals and mercury will be analyzed.	U.S. EPA Region 5
Funds will be committed to support mercury research in a number of priority areas including transport, transformation and fate; and human health and wildlife effects of methyl-mercury.	U.S. EPA Region 5
EPA will complete the pilot projects to establish TMDL allocations for two waterbodies receiving mercury from atmospheric deposition in order to evaluate the integration of air and water program technical tools and authorities and to examine emission reduction options.	U.S. EPA Region 5

The following table includes actions proposed by Canada and the U.S that could be accomplished in the next two years if funding were made available.

Table 9.6 Proposed Mercury Actions Needing Funding

PROPOSED ACTIONS FOR MERCURY	LEAD AGENCY OR FUNDING SOURCE
Pollution Reduction	
Locally Based	
Green Community thermostat and thermometer collection program for the City of London, Ontario (requires an alliance with Honeywell and City of London).	EC
Clean Sweep pesticide program in the city of London, Ontario (requires an alliance with the Ontario Ministry of the Environment and the City of London).	EC
Provide Pollution Prevention training at hospitals in Sarnia, Ontario with emphasis on the removal of mercury containing devices.	EC
Lake Erie Basin	
Agencies will promote energy conservation programs (e.g. U.S. side: EPA Energy Star Program) within the Lake Erie basin; agencies will especially urge the publicly-owned facilities, schools and universities in the Lake Erie basin to participate in energy conservation programs. The agencies will also work with the utilities operating in the basin to coordinate government and utility energy conservation programs.	U.S. EPA and States
Agencies will seek funding to initiate or continue permanent household and agricultural (e.g. pesticides) hazardous waste (HAHW) collection depots in the largest Lake Erie basin cities. Furthermore, U.S. agencies will seek funding to initiate and continue periodic or mobile collections for the more remote locations within the Lake Erie basin. Collections will not be limited to pesticides but will include a focus on mercury containing products (e.g. thermometers, abandoned appliances). U.S. agencies will seek funding to initiate and continue Lake Erie basin HAHW education programs that will include information about how individuals can practice home environmental stewardship; how to identify HAHW; and how to properly dispose of HAHW.	U.S. EPA and States
Great Lakes Basin	
Agencies will provide indirect or direct financial support to businesses, organizations and local governments for pollution prevention projects. Possible projects include clean sweeps, bounties on mercury products, mercury swaps for alternative products, education, purchasing policies, energy conservation, water conservation, pay-as-you-throw trash disposal fees and others.	U.S. EPA and States
Agencies will encourage a nationwide dialogue on the import of mercury bearing products. Nationwide labeling of mercury products will also be encouraged.	U.S. EPA and Michigan
Agencies will identify facilities that use wet scrubbers to treat emissions. If mercury is accumulating in the scrubber water, the feasibility of recycling the water in a closed loop system rather than being discharged will be evaluated.	U.S. EPA and Michigan
Agencies will work with communities to provide sector-specific pollution prevention outreach such as workshops for the medical and dental communities, and other important sectors.	U.S. EPA and States

9.5.5 Conclusions

In order to bridge the data gaps identified, the following recommendations should be followed:

1. Emissions inventory databases need to be extended to include area and mobile sources and other minor sources that might provide a local or regional input to models which predict deposition rates.
2. More accurate inventories of both natural and anthropogenic sources and the chemical species emitted are needed to better delineate long-range transport of pollutants like mercury.
3. Locational information for mobile sources and area sources that may impact model predictions of deposition rate, seasonal variations, etc., is needed.

The Lake Erie LaMP is looking to focus on reducing anthropogenic sources of mercury from the environment and restoring the beneficial uses of Lake Erie. The committed actions and proposed recommendations lay a foundation for completing this goal.

9.5.6 References

Binational Toxics Strategy Draft Report Mercury Sources and Regulations (November 1999) Canada and U.S. <http://www.epa.gov/bns/mercury/>

Binational Toxics Strategy; Mercury Reduction Activities Reported from Around the Great Lakes. Canada and U.S. <http://www.epa.gov/glnpo/bnsdocs/stakeholders1198/mercsuccess.html>

Cooperating to Implement The Great Lakes Water Quality Agreement. The Great Lakes Binational Toxics Strategy. Canada and United States, Strategy for the Virtual Elimination of Persistent Toxic Substances in the Great Lakes.

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Long-range Transport of Pollutants of Concern. Delta Institute, 1999. Based on OMB Draft Deposition of Air Pollutants to the Great Waters, 3rd Report to Congress, August 11, 1999 and Draft Atmospheric Deposition of Toxics: Integrating Science and Policy, Delta Institute, October 1999.

Realizing Remediation, A Summary of Contaminated Sediment Remediation Activities in the Great Lakes Basin. GLNPO, March 1998.

Remediation of Contaminated Sediments at the Unnamed Tributary to the Ottawa River Summary Report, January 2000. Prepared by Blasland, Bouck & Lee, Inc. for the U.S. EPA/GLNPO, Ohio Environmental Protection Agency and City of Toledo.

U.S.G.S. (in prep.) Water Resource Investigation Report: Occurrence and distribution of contaminants of concern in surficial bed sediments of the Lake Erie-Lake St. Clair basin, 1990-97. U.S. Geological Survey, Department of the Interior, National Water Quality Assessment Program (NAWQA).

9.6 Plans for LaMP 2002 Report

As noted throughout this report, there is still much work needed to document the current and projected state of the Lake Erie ecosystem. For example, the invasion of the zebra mussel has had far-reaching impacts on the system, thus requiring identification of additional research that will be needed just to redefine the current baseline. Based on items presented in this LaMP 2000 document, LaMP 2002 will highlight the following activities at a minimum.

- All of the BUIA background documents and impairment conclusions will be finalized.
- Investigations will begin/continue on the causes of the BUIAs.
- Source track down activities for the critical pollutants and the additional pollutants of concern in Lake Erie will be implemented.
- A comparison of ambient environmental concentrations of contaminants will be made with existing standards and GLWQA Annex 1 objectives to identify additional critical pollutants and “likely to impair” pollutants.
- The work/results of the Lake Erie at the Millennium project will be available and used to determine additional research needs and monitoring on Lake Erie.
- Ecosystem objectives and indicators will be selected.
- Short-term and long-term activities to achieve the selected ecosystem objectives will be identified.
- Monitoring and surveillance programs will be designed to measure the changes in the Lake Erie ecosystem and compared to the selected ecosystem indicators so progress in restoring the lake’s beneficial uses can be tracked.
- Efforts will be made to strengthen the links between RAPs and the LaMP to assist in establishing priorities in selecting the remedial actions that will be most effective in protecting and restoring Lake Erie.
- The LaMP will incorporate the implications of significant ongoing and emerging issues into its overall workplan.
- Progress of the existing projects in the three action plans will be tracked.
- Efforts will be made to implement the proposed projects in the three action plans.
- Follow-up and updates to all of the other issues presented in the LaMP 2000 Report will be presented.
- Lake Erie LaMP websites will be improved and updated.
- Habitat restoration strategy will be developed.
- Lists of ongoing and proposed habitat projects will be updated.